

**TREATMENT OF COMBINED HEAT AND POWER (CHP)
UNDER THE MASSACHUSETTS APS PROGRAM**

**DETERMINATION OF APS ALTERNATIVE ENERGY ATTRIBUTES
AND EFFICIENCY STANDARDS**

**Department of Energy Resources
February 5, 2009**

The Massachusetts Department of Energy Resources (DOER) issued emergency regulations (225 CMR 16.00) in January 2009 which provide for the new Alternative Energy Portfolio Standard (APS). Section 16.05(1)(a)2 provides for the eligibility of Combined Heat and Power (CHP) units and further provides for the determination of the amount of APS Alternative Energy Attributes qualified units would receive based on its thermal and electrical outputs, and imposes certain efficiency standards that units must achieve to be eligible to receive such Attributes.

DOER hereby provides a summary of these rules, and provides for an alternative methodology that may be adopted instead. *Public comments on these methodologies will be received by DOER through February 19, 2009.*

A summary of the regulatory treatment of CHP units is shown in the following table. Within APS, DOER provides eligibility opportunity for all CHP applications – not just new units but also for existing electric-only power plants to serve useful thermal loads, for existing thermal-only units to generate electric energy, and for pre-existing CHP units to expand.

The calculation of APS Attributes and imposition of Efficiency Standards are applied by DOER to encourage CHP units to expand their combined electrical and useful thermal outputs, but also balance the relative outputs to achieve the maximum overall benefits of CHP.

After submission of the emergency regulations, DOER reconsidered its innovative approach to calculating APS Attributes and applying Efficiency Standards, and derived a new proposed modification. Although the two methodologies presented appear to have very different mathematical forms, the results are not that different in their practical use. In fact, in the cases covered by the middle four rows of the summary table, the Attribute calculation reduces in all practical circumstances to the same formula.

However, the newly proposed modified formulas can be applied more effectively and universally without creating perverse incentives, particularly in the case of a new CHP unit with no pre-existing operation. In this case, the proposed new modification avoids the following two unintended consequences of the original formula.

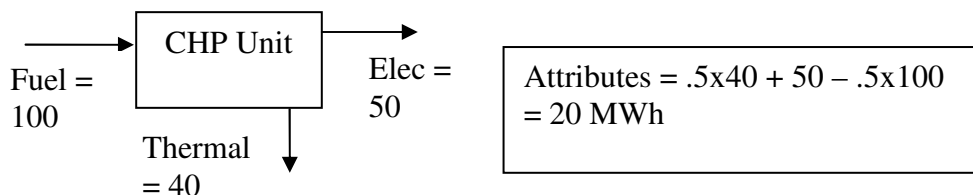
- A new CHP unit with 25% electrical efficiency and 50% thermal efficiency is not incentivized under the original formula to use the remaining 25% of its waste heat, whereas the unit is so rewarded under the new formula.
- Under the new formula, the maximum Attributes go to the thermodynamically best performer (i.e., a unit with 50% electrical efficiency that uses the remaining 50% as useful thermal energy). Under the original formula, the maximum Attributes are provided to a CHP unit with 33% electrical efficiency and 66% useful thermal energy.

Under the proposed new methodology, the Efficiency Standard is made unnecessary, and avoids the somewhat arbitrary 70% standard in the original draft regulations. The modified Attribute formula is such that only units that achieve high efficiencies yield positive Attributes. The formula and implied efficiency standard assure that an eligible CHP unit operates at an efficiency significantly greater than the efficiency otherwise achieved by utilizing a stand-alone high efficiency (near 100%) thermal unit and efficiently generated (e.g. combined cycle) grid power (near 50%).

A couple examples of how CHP units are treated under the APS program utilizing the modified formula are provided below.

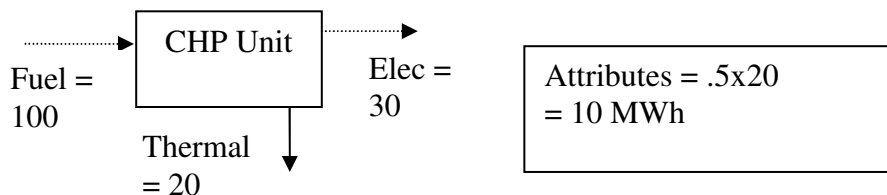
1. New CHP unit (no pre-existing operation)

Utilizes 100 MWh units of Fuel, generates 50 MWh of electric output and 40 MWh_{th} of useful thermal energy.



2. New CHP unit (previously operating electric-only unit that adds Useful Thermal Energy)

Power plant with 100 MWh units of Fuel and 30 MWh of electric output, now uses 20 MWh_{th} of useful thermal energy (at no incremental increase in fuel).



| 225 CMR 16.00 Section: 16.05(1)(a)2a | CHP Application | Current Draft Regulations | | Proposed Modifications | |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | APS Attribute Calculation | Efficiency Standard | APS Attribute Calculation | Efficiency Standard |
| i. | New CHP Unit with no pre-existing operation | Lesser of 50% Useful Thermal Energy and Electrical Energy Generated | 70% | 50% of Useful Thermal Energy + Electrical Energy Generation - 50% of Fuel Higher Heating Value | Imposition of Efficiency Standard is unnecessary. The proposed Attribute Calculation formula only yields positive Attributes when efficiency (total or incremental) exceeds high efficiency non-CHP options, i.e., $(50\% \text{ Useful Thermal Energy} + \text{Electrical Energy Generated}) / \text{Fuel Higher Heating Value} > 50\%$ |
| ii. | New CHP Unit which operated previously as Electricity-only unit | same as above | n/a | 50% of Useful Thermal Energy - 50% of Incremental Fuel Higher Heating Value | |
| iii. | New CHP Unit which operated previously as Thermal-only unit | same as above | 70% | Electrical Energy Generated - 50% of Incremental Fuel Higher Heating Value | |
| iv. | Existing CHP Unit which adds Incremental Useful Thermal Energy | 50% of Incremental Useful Thermal Energy | n/a | 50% of Incremental Useful Thermal Energy - 50% of Incremental Fuel Higher Heating Value | |
| v. | Existing CHP Unit which adds Incremental Nameplate Elec. Capacity | Incremental Electrical Energy Generated | 70% | Incremental Electrical Energy Generated - 50% of Incremental Fuel Higher Heating Value | |
| n/a | Existing CHP Unit which adds Incremental Useful Thermal Energy and Incremental Nameplate Elec. Capacity | Lesser of 50% Incremental Useful Thermal Energy and Incremental Electrical Energy Generated | 70% | 50% of Incremental Useful Thermal Energy + Incremental Electrical Energy Generated - 50% of Incremental Fuel Higher Heating Value | |